UNIVERSITY OF SASKATCHEWAN

Department of Computer Science

CMPT 434.3 MIDTERM EXAMINATION

November 3rd, 2004

Total Marks: 50

CLOSED BOOK and CLOSED NOTES
NO CALCULATOR

Time: 50 minutes

Instructions

Read each question carefully and write your answer legibly on the examination paper. **No other paper will be accepted**. You may use the backs of pages for rough work but all final answers must be in the spaces provided. The marks for each question are as indicated. Allocate your time accordingly.

Ensure that your name AND student number are clearly written on the examination paper and that your name is on every page.

Question	Marks
1 (6 marks)	
2 (6 marks)	
3 (12 marks)	
4 (14 marks)	
5 (12 marks)	
Total	

Name: _____

Student Number: _____

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1. **General** (*6 marks in total – 1 mark for each part*) Give the technical term that best fits each of the following descriptions or definitions.

   (a) The Internet protocol used for transferring email from the sender's mail server to the recipient's mail server.

   (b) A network architecture that uses fixed-size cells (rather than variable-sized packets) and a virtual circuit (rather than datagram) form of packet switching.

   (c) The field in the IP datagram header that is used to limit the lifetime of a datagram in the network.

   (d) A measure of frequency, in units of cycles per second.

   (e) The primary inter-AS routing protocol that is used in the Internet.

   (f) The task of ensuring that a sender is not transmitting data faster than it is being read at the receiver, so as to prevent receiver buffer overflow.

2. **Data Communication Basics** (*6 marks in total*)

(a) (*2 marks*) Consider a modem that uses both amplitude and phase modulation. There are 4 amplitudes used, as well as 4 phase shifts, so there are 16 different combinations. If the data transmission rate as measured in baud is 8,000, what is the rate in Kbits per second?

(b) (*2 marks*) What two properties of a channel fundamentally limit the maximum achievable data transmission rate?

(c) (*2 marks*) Which (one or more) of the following types of delay would you expect to see decrease if the data transmission rate on a channel is increased from 10Mbps to 100Mbps: propagation delay, transmission delay, queueing delay?

3. **Application Layer** (*12 marks in total*)

(a) (*6 marks*) Outline the steps that can be involved in translating a hostname into an IP address.

(b) (*6 marks*) Caching is used in both DNS and the Web. Describe the *similarities* and the *differences* between these systems with respect to how they address the issue of cache consistency (i.e., the possibility that cached items may become "stale").

4. **Transport Layer** *(14 marks in total)*

(a) (*2 marks*) State two tasks that are accomplished when a TCP connection is established using TCP's connection establishment protocol.

(b) (*6 marks*) In what way(s) does TCP resemble "Sliding-Window Go-Back-N", and in what way(s) does it resemble "Sliding-Window Selective Repeat"?

(c) (*6 marks*) State the two main types of approaches to network congestion control, and give one major advantage of each.

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5. **Network Layer** *(12 marks in total)*

(a) (*6 marks in total*) In a large system like the Internet, of potential concern is the size of the router forwarding tables.

(i) (*4 marks*) What does a router forwarding table contain?

(ii) (*2 marks*) What is done in the Internet to try to keep these tables reasonably small?

(b) (*6 marks*) In computer networking, sometimes the requirement for *adaptivity* (i.e., quick responsiveness to changes in network conditions) is in conflict with the requirement for *stability*. Describe how this conflict arises in network routing, and how it is usually resolved.

The End